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THE GRASSES AND SALTBUSHES OF AUSTRALIA

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GRASSES

1. Value of Native Grasses to the Pastoral Industry

The native grasses of Australia are famous throughout the world, not only for their fattening and wool-producing qualities, but also for their remarkable ability to withstand the effects of drought. It is upon the excellence of the native grass pasture, coupled with the indigenous saltbushes and other edible fodder plants that the success of the great pastoral industries of the Commonwealth primarily depends. Moreover, while it is true that in the progress of the development of most countries, the pastoral industry tends to become overshadowed in importance by other industries, and while it is also true that dry-farming methods can extend the area of cultivation far beyond what was thought possible a few years ago, nevertheless the excellence of Australian pastoral products, particularly as regards wool and mutton, renders it probable that the pastoral industry will for long retain its position as one of the chief sources of Australia's wealth.

In this connection, also, the fact must not be lost sight of that no cultivated plants have as yet been, or are likely to be, found which can replace, with their drought-resisting qualities, the native grasses, saltbushes, and edible fodder plants.

2. Dairying and Introduced Grasses

Besides the wealth produced from wool growing and sheep and cattle-raising, there must be also considered that derived from dairying. This industry is confined chiefly to the coastal belt and highlands of Australia. In New South Wales, Victoria, South Australia, Western Australia and Tasmania, well known introduced grasses like Cocksfoot, Perennial Rye, Timothy, **Phalaris bulbosa** and many others, find on the coasts and tablelands a climate pre-eminently adapted to their requirements. Under a fair rainfall and not too hot conditions they may be said in such localities to be superior to the native grasses which they have replaced. A new introduced plant is occasionally found which proves a boon to certain districts when laid down to cultivation. Particularly is this the case with **Paspalum** on the northern rivers of New South Wales, Rhodes grass for light and hot soils, Strawberry Clover for Gippsland, Victoria, and Egyptian Clover for South Australia. The history of **Paspalum** reads almost like a romance. Introduced from the hot moist climate of South America it found most congenial surroundings in the coastal districts of New South Wales, and what were once villages on the northern rivers are now thriving

townships.

In most of the dairying districts of Queensland, however, native grasses still hold pride of place. A hot summer and at times precarious rainfall prove too much for introduced grasses, and although such exotic dry country grasses as Rhodes are making headway, it is doubtful if the results produced can come up to those from the native grasses.

3. Distribution of the Native Grasses

The distribution of the native grasses of Australia may be said, generally speaking, to be more dependent on climatic conditions than on soil considerations. Australia possesses three distinct rain zones, viz., a summer rain zone extending from the Northern Territory and embracing the north western portion of Western Australia, Queensland, and the northern and north-western portion of New South Wales, a neutral rain zone, extending over the middle portions of the continent, and a winter rain zone, which embraces the Riverina portion of New South Wales, practically the whole of Victoria and Tasmania, and the southern portions of South Australia and Western Australia. In considering the grasses in these places, we find that the dominant species are those best adapted to the climatic conditions. For example, out of 54 different species of the genus **Panicum**, 27 are found in the Northern Territory, 30 in Queensland, 20 in New South Wales, and only 5, 8 and 6 in Victoria, South Australia and Western Australia respectively. The **Panics** are summer grasses and are best adapted to hot summer conditions. On the other hand, the **Agrostis** species are typical winter grasses, and we accordingly find them most common in Tasmania (11 species), South Australia (6 species), Western Australia (6 species), Victoria (12 species), southern portion of New South Wales (8 species), while they are practically absent in the Northern Territory (0 species), and in Queensland (2 species).

Some very cosmopolitan grasses are the **Danthonias**, **Eragrostis**, **Themedas** and **Stipas**. The rareness of the last named genus in the Northern Territory is probably due to the fact that the more vigorous growing grasses crowd them out. As a rule the grasses growing in the summer rain zone lend themselves to greater variety and bulk of feed than those of the winter rain belt. For example. Queensland, the Northern Territory and the northern parts of New South Wales may be considered typical cattle country, owing to the variety and vigorous nature of the grasses, although typical sheep grasses are of course abundant in the way of smaller grasses growing amongst the larger ones. Such strong growing grasses as **Panicums**, **Astreblas**, **Andropogons**, **Erianthus** and **Aristidas**, of which there are many species and which freely inter mingle with each other, often dominate the situation.

4. Dominant Genera

Of a total of 433 species in Australia, 210 are confined to New South Wales.* Using Bentham's figures, out of a total of 346 native species in Australia# 144 are confined to the Northern Territory, 164 to Queensland, 149 to New South Wales, 93 to Victoria, 68 to South Australia, 89 to Western Australia, and 62 to Tasmania. Although, as seen by the figures brought up to date in New South Wales, the numbers are now greater in each State, they are conclusive enough to show that the bulk of the grass flora is found in the States of New South Wales, Queensland and the Northern Territory.

The dominant genera, i.e., grasses which provide the bulk of herbage in each State are as follows:-

- NORTHERN AUSTRALIA. - **Panicum**, **Xerochloa**, **Rottboelia**, **Ischoerum**, **Ectrosia**, **Chloris**, **Eragrostis**, **Erianthus**, **Diplachne**, **Andropogon**, **Aristida**, **Themeda**, **Triodia** and **Eriachne**.

- QUEENSLAND. - **Panicum, Astrebla, Ischoemurn, Aristida, Erianthus, Andropogon, Themeda, Chloris, Eragrostis, Sporobolus and Eriachne.**
- NEW SOUTH WALES. - **Panicum, Cynodon, Chloris, Danthonia, Eragrostis, Sporobolus, Aristida, Stipa, Andropogon, Themeda, Astrebla, Pappophorum and Sorghum.**
- VICTORIA. - **Danthonia, Eragrostis, Poa, Glyceria, Sporobolus, Stipa, Agropyron, Themeda, Agrostis and Panicum.**
- SOUTH AUSTRALIA. - **Danthonia, Themeda, Eragrostis, Poa, Chloris, Agrostis, Cynodon, Glyceria, Stipa, Andropogon and Pappophorum.**
- WESTERN AUSTRALIA. - **Panicum, Neurachne, Stipa, Andropogon, Themeda, Danthonia, Agrostis, Poa, Dichelachne and Agrostis.**
- TASMANIA. - **Agrostis, Danthonia, Poa, Stipa, Amphipogon, Hierochloe, Microloena and Tetrarrhena.**

5. The Most Important Native Grasses

(i.) The **Mitchell** grasses (**Astrebla** species) may be said to hold perhaps the highest reputation of all the native grasses. They are very common on the black and red soils in the interior of New South Wales, Queensland, and the Northern Territory. The leaf is abundant and relished by stock of all kinds, while the seed is also nutritious. They provide feed in warm situations practically throughout the year. At present the Mitchell grasses are considered so valuable that the seed is a marketable commodity.

(ii.) The **Andropogons**, including **Andropogon sericeus** (Queensland Blue grass), **A. intermedius** (Rare Blue grass), **A. bombycinus** (Silky heads), **A. refractus** and **A. pertusus** (Pitted Blue grass) are very common in New South Wales and Queensland, and less common in the Northern Territory. Queensland Blue is highly spoken of by all pastoralists for its succulence and perennial qualities. Rare Blue appears to like moist situations better, and in such localities usually provides a greater bulk of feed than does Queensland Blue. The common Queensland Blue grass also grows in the Northern Territory, but the **Andropogons** in that locality, e.g., **A. procerus, A. annulatus, and A. exaltatus** are more of the vigorous tall-growing kind, although probably as palatable as our own. The seed of Queensland Blue is also a marketable commodity; it is of such fluffy nature, however, that hand-sowing must be resorted to if required to bring it under cultivation.

(iii.) The **Panic** grasses are extremely common and variable. They are mostly quick-growing summer grasses, succulent, palatable, and free seeders. If given a free chance to seed they become a valuable asset to grazing country. Some of the more important are:-

Panicum decompositum (Australian or Native Millet). This is a very wide-leaved succulent grass, and extremely drought-resisting. It is common to most of the States and appears to be very dominant in moist black or red soils.

Panicum queenslandicum, Domin (Coolah grass). This grass is very common in the pastures of the Northern Territory, Queensland, and New South Wales, and is characterised by its extreme powers of drought-resistance. This grass closely resembles **P. trachyrachis** another drought-resistant species, but much less common.

Panicum flavidum, Retz, and P. globoideum, Domin, growing in warm, moist situations, are also valuable pasture grasses in the Northern Territory, Queensland, and New South Wales. They are extremely free seeders.

Valuable *Panic* grasses confined to the Northern Territory are **P. piligerum, P. argenteum, and**

P. prostratum. Some cosmopolitan good **Panic** grasses are **P.leucophoeum** (Cotton Panic), **P. sanguinale** (Summer grass), **P. eff u.s-urn**, and **P.**

(iv) The **Eragrostia** grasses are very cosmopolitan and may be found right through out the Commonwealth. Some, like **E. Brownii**, **E. leptostachya** and **E. leptocarpa**, grow in favourable situations on the coast and tablelands, and provide a fair amount of feed. Others, like **E. Laniflora**, **E. speciosa**, and **E. Lacunaria**, are adapted to hot, sand'. situations, and are small and wiry. The root system of some of these shews their adaptation to hot conditions, for even in the mature root, a sheathing case of sand and hairs is present as a protection against burning and evaporation.

(v.) The **Danthonias** provide a great quantity of 'vinter feed in the cooler parts of the continent. They are commonly known as White Top or Wallaby grasses. Able to stand a good deal of stocking and very palatable, some of the finest sheep in the State of New South Wales are grown on **Danthonia** pastures in Yass district. The **Danthonias** - are particularly valuable for shallow or poor soils, and in these situations have been turned to such good account that the seed is now a marketable commodity.

(vi.) The **Couch** grass (**Cynodon dactyctm**) association in New South Wales is well known to all dairymen. Many poor clay soils would be in a bad way as regards pasturage were it not for this fine little fighting grass. In sandstone country on the coast a com mon grass association is **Couch**, **Eragrostia leptostachya**, and **SporoboLus**.

(vii.) The **Themeda** grasses, better known as Kangaroo grasses, will be found growing in nearly every conceivable situation throughout the Commonwealth. The commonest is **Themeda Forskalii** previously known as **Anthistiria ciliata**, and there is no doubt that this grass provides excellent feed in the interior. Owing to its shy seeding habits, however, and its sensitiveness to stocking, it is rapidly dying out in many situations, and is becoming more common on protected areas, such as railway enclosures, than elsewhere. Its one time congener, **Iseilema membranacea**, previously called **Anthtetiria membranacea** is well known to the pastoralist of Queensland, northern New South Wales, and the Northern Territory, as Landsborough grass. Although smaller than the ordinary Kangaroo grass it will stand heavier stocking, and is considered more palatable.

(viii.) The **Erianthus** grasses, and particularly **E fulvus**, commonly known as Sugar grass or Brown Top, are also considered very valuable grasses in the interior of New South Wales, Queensland, and the Northern Territory. Indeed, from the point of view of drought-resistance and permanence, it would be difficult on the black soils to replace the Sugar grass with a better.

There are many other genera, of which there may be only one or two species, widely distributed over the continent and providing a large quantity of feed. Some of the more valuable are : - **Lappago racemosa** (Burr grass), **Neurachne rnitchelliana** (Mulga grass), **Dactyloctenium aegyptiacum** (Crowfoot grass), **Eriochloa polystachya** (Early Spring grass), and **Diplachne fusca** (Swamp grass).

(ix.) **Sheep Grasses**. The **Chloris**, Windmill, or Star grasses are amongst the most valuable sheep grasses. **Chioris acicularis**, **C. truncata**, **C. ventricosa**, and **C. barbata** are the commonest and best. The last named is considered so valuable, resembling the introduced **Rhodes** grass very much, that the seed is a marketable commodity.

(x.) **The Stipas**. These are commonly called Spear grasses. They are very common in Western Australia, South Australia, Victoria, and the Riverina district in New South Wales. In many situations, such as rocky slopes, these grasses are valuable, providing feed for sheep for the greater part of the year, but it is to be regretted that during a good season these Spear grasses, particularly **S. setacea**, **S. scabra** and **S. semibarbata**, become very troublesome. The growth

becomes too rapid for the sheep and the grasses develop seed. These seeds are extremely sharp pointed and provided with a twisted and which is sensitive to hygroscopic conditions. The result is that they are able to work their way into the organs of the sheep, and particularly affect the eyes. "Spear-grass" country is not looked on favourably by pastoralists. Fortunately, in good country it is possible, by judicious management, for the good grasses to overcome the **Stipas**.

(xi.) The **Aristidas**, commonly known as Wire grasses, are also widely distributed, and possess an inferior value only. **A. Leptopoda** and **A. Behriana** are the only ones providing an average amount of feed in the interior.

In the colder mountainous districts the **Poa** and **Agrostis** species provide the bulk of the feed. The grasses found on the southern mountain heights of New South Wales remind one very much of similar grasses in Europe.

6. The Future of Native Grasses

The future of our pastoral wealth depends on the maintenance of our native grasses. At present the three principal enemies of our pastures are rabbits, droughts, and over-stocking. The rabbit evil on level country, thanks to wire-netting, and a vigorous offensive on the burrows, is being checked. The effects of drought will be probably minimised in the future by anticipatory measures, such as the conservation of fodder, the construction of large dams, and cross-country rail ways to allow of speedy agistment. At present, the actual deleterious effect of droughts on the native grasses lies in the eating and killing-out of the better varieties, an evil aggravated, of course, during drought periods by slowness of growth and non-seeding habits.

7. Over-stocking

Over-stocking during drought periods should be avoided, but over-stocking in normal periods is to be deplored. Evidence exists on every hand that many of our large holdings are being over-stocked, *i.e.*, that the stock are being carried on the paddocks in such numbers, and to such an extent that the good grasses are not allowed to seed, but become depastured and replaced by introduced or noxious herbage. Miles of country in the interior (that once had a profitable carrying capacity) are now covered with thistles and other useless herbage. The spread of Barley grass (**Hardelun mur-inum**) Barren Fescue (**Festuca bromoides**), the useless Bromes (**Bromus maxirnus**, **B. mollis**, etc.), and other valueless or even noxious agricultural grasses in New South Wales, has also been remarkable. Less than twenty years ago they were varieties in many places, now they have taken almost complete possession of the pastures, but, as the survival of the fittest indicates that present conditions in many localities are more favourable for these than for the native grasses, it follows that, unless the latter are nursed and encouraged, the useless introduced grasses and weeds will predominate where at one time the natural herbage thrived. It is natural that a grazier should desire to produce from his land the largest amount of wealth he can, by stocking to the fullest capacity, but satisfactory financial results cannot be maintained by doing so. The deterioration which a pasture undergoes by continued overstocking must result in a considerably lessened carrying capacity, and, although exact data are not available, the loss thus incurred to the Commonwealth must be considerable.

8. Conservation of Pastures

The problem of conserving and restoring native pastures, has, in many localities, been met by thoughtful graziers gathering the seed of the good grasses, and scattering it on the loose soil of their runs during the rainy season. Although the vitality of native grass seed is fairly low, it is particularly characterised by the length of time it can stay in the ground and then germinate under

satisfactory conditions. The black soils are particularly adapted for this method of treatment.

9. Division and Resting of Pastures

It is clear, however, that the main success in checking deterioration will be ensured by dividing pastures and resting them from time to time. Many beneficial results have been secured by resting pastures, and if the process is continued at periodic intervals a good stand of grass is secured over a large area, and the carrying capacity increased enormously.

Most graziers divide their areas into paddocks, but in many cases these are far too large. The larger the paddocks the greater the trampling, and the more the best grasses are picked out, eaten down, and prevented from seeding. In an area of 12,000 acres, say, eight paddocks would not be too many. Once a good stand of grass is obtained in paddocks of limited area, judicious handling of such paddocks will produce a maintenance of the pastures for an indefinite period.

10. Native v. Introduced Grasses

The introduction of ex-Australian grasses can only be advocated for those districts where the climatic conditions are similar to those of the countries whence introduced. Such country is mostly confined to the coast and tablelands of Australia and to Tasmania. Owing to the high vitality of the seed and the improvement which has taken place under many years of cultivation these grasses have replaced the native in many parts. Such grasses as **Paspalum**, Rhodes, Perennial Rye, Cocksfoot, Timothy, and Tall Fescue are largely grown, while the newer but valuable grasses like **Phalaris bulbosa**, **Bromus inermis**, and Prairie are slowly growing in popularity.

11. Cultivation of Native Grasses

Up to the present the placing of native grasses under cultivation has not been carried out commercially. The difficulties which have to be contended with are as follow : - **(a)** The uncertain vitality of wild seed, **(b)** the scarcity and high price of native grass seed on the market, **(c)** the large area of native pastures, giving sufficient feed for practical requirements. When the cultivation of native grasses becomes an accomplished fact, it will be on the inland slopes and those areas where closer settlement prevails.

12. Improvement of Native Grasses under Cultivation

That a great improvement takes place in the native grasses when cultivated is well seen by experiments carried out at State Experiment Farms. Succulence and bulk are considerably increased, even in a very short time. Particularly has this been noticed in such grasses as Mitchell grass, Queensland Blue grass, the Panic grasses, and Brown Top or Sugargrass (**Erianthus fulvis**). When we consider that it is only after many years of cultivation that the present improvement in our introduced grasses has resulted, the striking improvement of the native grasses under cultivation in such a short time is distinctly encouraging. It is probable that good seeding habits, bulk, etc., will be improved by selection. The value of such experimental work cannot be over-estimated since, as before pointed out, it will be difficult, if not impossible, to replace our native grasses of the interior with better plants. The pastoral industry of Australia is such a valuable asset that every means should be taken not only to conserve the native pastures as much as possible, but to work and aim at increasing their present carrying capacity.

SALTBUSHES

1. General

The saltbushes belong to the botanical order **Chenopodiaceae**. They are all plants adapted to alkaline soils, and grow thickly in the interior. Their adaptability to the hot and dry situations of Australia is shewn in the succulent nature of the leaves, in the more or less hairy investiture, and in the deep-rooting system. The edible saltbushes practically belong to the four genera, viz., **Atriplex**, of which the Old Man Saltbush is representative; **Kochia**, or cottony saltbushes; **Rhagodia**, red-berried salt-bush; and **Enchylaena**, Barrier or Spiny saltbushes.

2. Value of Saltbushes

The value of saltbushes lies particularly in their drought-resistance, which stands out prominently when other grasses and herbage fail. They also grow in arid districts where the rainfall is extremely small, and where grasses are few in number and sparsely scattered. Although saltbushes are not appreciated to any extent when grasses and other herbage are plentiful, during drought periods they are readily and even greedily eaten by stock.

The free-seeding and rapid growing habits of the saltbushes are particularly advantageous in allowing them to quickly revive after heavy stocking during drought periods, all the more so, as in normal seasons, when the grasses and herbage are plentiful, they are not eaten to any great extent.

3. Fodder Value of Saltbushes

In this connection some useful experiments were carried out at the State of New South Wales Experiment Farm, at Coolabah, in 1906 and 1907. The result of these experiments gives a definite idea of the value of saltbush as a fodder, and its effect on the texture of the wool. The report of a prominent pastoralist on these experiments is as follows : - "I had the sheep in the yard and had a good look at them. They have altered very much since they were taken to the farm, and have also altered since last year; the wool has grown smaller in the fibre, and shows a shorter and weaker staple without any increase in quality to make up for the loss in weight. They have not grown the frame they would, running on natural pastures, I cannot understand why they have produced such a black yolk tip, quite as good a tip as you see on sheep reared in a cooler climate. I can give no reason why sheep fed on natural grasses and herbage show a white tip inclined to be fuzzy, while these sheep, fed only on saltbush, show a good tip. Although they have not grown a really profitable fleece, nor produced the carcass of more highly-fed sheep, the experiment proves that sheep can be kept alive on saltbush only, for a considerable time, possibly for long enough to tide over a severe period of dry weather, and probably at less cost than by expensive means of artificial feeding. The experiment has also shewn that saltbush can be grown at little cost - at a less cost than any other fodder - in a very dry time, and is practically drought - resisting." It might be remarked that these experiments were carried over a period of twenty-one months, during which time the sheep were entirely fed on saltbush.

4. Distribution of Saltbushes

The principal saltbush genera are distributed as follows:

(i.) **Atriplex**. Northern Territory, 4 species; Queensland, 8 species; New South Wales, 14 species; Victoria, 10 species; South Australia, 18 species; Western Australia, 12 species; and Tasmania, 4

species.

(ii.) **Kochia**. Northern Territory, 1 species; Queensland, 3 species; New South Wales, 11 species; Victoria, 6 species; South Australia, 10 species; and Western Australia, 6 species.

(iii.) **Rhagodia**. Queensland, 5 species; New South Wales, 7 species; Victoria, 5 species; South Australia, 6 species; and Western Australia, 5 species.

It is to be noted that the more arid districts, like the west of New South Wales, and South Australia, are better provided with saltbushes than the Northern Territory with its heavy rainfall; this is as it should be.

5. Some of the more Important Saltbushes

Atriplex nummularia, Lindl (Old Man saltbush). This is very common in Queensland, Victoria, New South Wales, and South Australia. It grows to a height of 10 feet, and is thus better protected from the ravages of drought and over-stocking than most saltbushes. It grows very rapidly and is considered palatable.

Atriplex leptocarpa, F.v.M. (Creeping saltbush). This is very common on the red and black soils. It is a rapid grower and a free seeder.

Atriplex semibaccata, R. Br. (Half-buried saltbush.) Has a very spreading and prostrate habit, and it thus protects both the soil and itself. A free seeder. This is one of the saltbushes successfully introduced into California, America, and is highly spoken of. Two cuttings of 20 tons each were obtained each season from an acre.

A. vesicaria, Hew, and **A. halimoides, Lindl**, although less common than the afore said, are considered more palatable. Unfortunately, their palatability and their annual habits tend to cause them to diminish under heavy stocking.

Other valuable saltbushes very common in South Australia and Western Anstralia are **A. stipitata, Benth., A. rhagodioides, F. v. M., A. muelleri, Benth.,** and **A. 8pongiosa.**

The **Kochias**, are much smaller than the **Atriplex** genus, with a finer leaf, and also, as a rule, hairier, while some are spiny. All are valuable as stand-bys in times of drought, and the commonest are **K. ciliata, F. v. M., K. villosa, Lindl., K. eriantha, F. v. M.** (South Australia), and **K. appressa, Benth.** (Western Australia).

The **Rhagodias** are less common in the interior than the **Atriplexes**. They will also grow in situations, as the coast and tablelands, where the others will not thrive. One of the best adapted to interior conditions is **Rhagodia hastata, R. Br.**, so called from its hastate or sword-shaped leaves. This saltbush has been proved to grow readily from cuttings, endures adverse conditions, and attains a great size in a year. It can be recommended as a hedge plant. Other good **Rhagodias**, and also found in the interior, are **R. nutans, R. Br.,** and **R. linifolia R. Br.** Some other particularly drought-resistant salt-bushes which provide feed under adverse conditions are **Enchylaena tomentosa, R. Br.** (the Barrier saltbush), and the **Scleroloenaa**, including **Scleroloena diacantha, Benth.,** and **S. paradoxa, R. Br.**

6. Cultivation of Saltbushes

The cultivation of saltbushes, like that of native grasses, is not yet carried on commercially. Experiments show, however, that they will grow readily from seed, cuttings, or roots. On a big

area where turning over for cultivation is impracticable, much might be done in ploughing a few furrows here and there, and planting three or four seeds in a hole during suitable seasons. By protecting the the young seedlings from stock for twelve months they should then be ready for grazing. The bulk of feed produced in normal seasons can be used as hay, which is an excellent stand-by during drought periods. Chemical analysis shows that the nutritive content of saltbushes is particularly high, and it seems an anomaly that, if it pays California to import seed and grow it profitably, there should be as little as there is under cultivation in Australia.

*Unpublished Census of New South Wales plants (Maiden and Betcher).
#Bentham's Australian Flora.

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